



4. The Court has subject matter jurisdiction over these claims under 28 U.S.C. §§ 1331 and 1338(a) and the patent laws of the United States, 35 U.S.C. § 1 *et seq.*

5. The Court has personal jurisdiction over Avnet consistent with the requirements of the Due Process Clause of the United States Constitution and the Texas Long Arm Statute. On information and belief, Avnet has regularly and systematically transacted business in Texas, directly or through subsidiaries or intermediaries, and/or committed acts of patent infringement in Texas as alleged more particularly below. Avnet has also placed integrated circuits using Taiwan Semiconductor Manufacturing Corporation Ltd. (“TSMC”) 28 nanometer and smaller technology<sup>1</sup> and products containing these integrated circuits (the “Accused Products”) into the stream of commerce by shipping Accused Products into Texas, shipping Accused Products knowing that those products would be shipped into Texas, and/or shipping Accused Products knowing that these Accused Products would be incorporated into other Accused Products that would be shipped into Texas. For example, Avnet maintains an office at 9601 Amberglenn Blvd, Suite 250, Austin, Texas 78729 within this district. On information and belief, Avnet provides services such as consulting, marketing, and sales from this location to customers in Texas. The Court therefore has both general and specific personal jurisdiction over Avnet.

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<sup>1</sup> TSMC 28 nanometer and smaller technology includes TSMC’s 28 nanometer technology (including TSMC’s High-k Metal Gate gate-last technology and high-performance compact technology) (“28 Nanometer”), TSMC’s 22 nanometer technology (including TSMC’s 22 nanometer ultra-low power, 22 nanometer ultra-low leakage, and 22 nanometer ultra-low leakage static random access memory technologies) (“22 Nanometer”), TSMC’s 20 nanometer technology (“20 Nanometer”), TSMC’s 16/12 nanometer technology (including TSMC’s 16 nanometer Fin Field Effect Transistor (“FinFET”) process, 16 nanometer FinFET Plus process, 16 nanometer FinFET Compact Technology, and 12 nanometer FinFET Compact Technology) (“16 Nanometer”), TSMC’s 10 nanometer technology (including TSMC’s 10 nanometer FinFET process) (“10 Nanometer”), TSMC’s 7 nanometer technology (including TSMC’s 7 nanometer FinFET process) (“7 Nanometer”). Globalfoundries reserves the right to accuse any forthcoming TSMC technology, such as TSMC’s 7 nanometer extreme ultraviolet lithography technology and TSMC’s 5 nanometer technology.

6. Venue is proper in this district under 28 U.S.C. § 1400(b) because Avnet has a regular and established place of business in this district and has committed acts of infringement in this district.

### **FACTUAL BACKGROUND**

7. Globalfoundries is a U.S. company with manufacturing facilities that use and develop some of the world's most advanced semiconductor devices available today. Building on IBM's world-class semiconductor technology heritage, Globalfoundries, the acquirer of IBM's semiconductor division, has been accredited as a Category 1A Microelectronics Trusted Source for fabrication, design, and testing of microelectronics by the U.S. Department of Defense (DOD).<sup>2</sup> Globalfoundries' East Fishkill, New York facility is currently the most advanced Trusted Foundry, and as such is the only facility of its kind that can provide certain advanced circuits to satisfy the DOD's requirements. As the second-largest foundry in the world and the only advanced Trusted Foundry, Globalfoundries is uniquely equipped to efficiently and quickly meet the DOD's advanced and highly classified manufacturing and production needs—and is also equipped to do the same for its private-sector clients.

8. Globalfoundries is the most advanced pure-play foundry in the U.S. and Europe, and employs thousands of people in the U.S. and worldwide. While other companies were abandoning semiconductor manufacturing in the U.S., Globalfoundries bucked this trend by investing billions of dollars on advanced technology and research in the United States. Globalfoundries originated from another leading U.S. semiconductor company, Advanced Micro Devices' semiconductor manufacturing arm in 2009 and expanded globally through acquisition

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<sup>2</sup> "Aerospace and Defense," <https://www.globalfoundries.com/market-solutions/aerospace-and-defense>.

and organic investment. Its largest expenditure by far is its \$15 billion organic U.S. investment in its leading-edge, 300 acre facility known as Fab 8 in Malta, New York. Globalfoundries broke ground for that state of the art facility in 2009 and produces leading edge technology from that location to customers worldwide. A major U.S. acquisition took place in 2015 when Globalfoundries acquired IBM's microelectronics facilities and personnel in Burlington, Vermont and East Fishkill, New York—facilities that became Fab 9 and Fab 10, respectively. Globalfoundries acquired not just IBM's facilities and personnel, but also the fruits of IBM's decades of industry-leading investment in U.S. semiconductor fabrication capacity and technology. Specifically, Globalfoundries obtained 16,000 IBM patents and applications (including the '497 and '966 patents asserted in this action); numerous world-class technologists; decades of experience and expertise in semiconductor development, device expertise, design, and manufacturing; and an expanded manufacturing footprint. The acquisition cemented Globalfoundries' role as a global leader in world-class semiconductor manufacturing and advanced process technologies.<sup>3</sup>

9. Globalfoundries' U.S. manufacturing facilities in Burlington, Vermont; East Fishkill, New York; and Malta, New York use and develop some of the most advanced process nodes and differentiated technologies (inclusive of its 12/14nm FinFET, RF and Silicon Photonics technology solutions) available today. Fab 8 is a leading fabrication facility for advanced manufacturing in the U.S., with 40,875 square meters of cleanroom space and continued expansion, and over 3,000 total employees as of June 2019. The current capital investment for the Fab 8 campus stands at more than \$15 billion, making Fab 8 the largest public-private sector

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<sup>3</sup> "Globalfoundries Completes Acquisition of IBM Microelectronics Business," <https://www.globalfoundries.com/news-events/press-releases/globalfoundries-completes-acquisition-of-ibm-microelectronics-business>.

industrial investment in New York State's history. The significance of this investment and its importance to advanced manufacturing in the U.S. have been recognized by top government officials, including by the President of the U.S. during a 2012 visit to New York hosted in part by Globalfoundries.<sup>4</sup>

10. Globalfoundries' investment from the Champlain Valley through the Hudson Valley makes it the spine of the Northeast's Tech Valley. Three out of Globalfoundries' five fabs are in the U.S., but investment does not stop at its manufacturing capacity. Globalfoundries' manufacturing footprint is supported by facilities for research, development, sales, and design enablement located near hubs of semiconductor activity, including in Santa Clara, California; Dallas, Texas; Austin, Texas; Rochester, Minnesota; Endicott, New York; and Raleigh, North Carolina. Of its 16,000 employees worldwide, approximately 7,200 are employed in the U.S.

11. Avnet is a technology solutions company that, among other things, markets and sells products from Xilinx, Inc. ("Xilinx"). The manufacturer of the Xilinx products accused of infringing in this action is TSMC. Unlike Globalfoundries, TSMC has taken a different approach and has decided to simply use Globalfoundries' patented inventions without payment or permission. TSMC is a competing semiconductor foundry with manufacturing facilities located primarily in Hsinchu, Taiwan. TSMC has recently expressed an interest in building a new manufacturing facility in the U.S., but has not reported any tangible steps towards implementing its ostensible interest. In contrast, TSMC completed building the most advanced manufacturing facility of its kind in mainland China last year. By bringing advanced 16nm FinFet to China, TSMC has positioned itself to benefit further from the shift in global supply chains out of the U.S.

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<sup>4</sup> "Globalfoundries Welcomes President Barack Obama to NY's Capital Region," <https://blog.globalfoundries.com/globalfoundries-welcomes-president-barack-obama-to-nys-capital-region/>.

and Europe into Greater China. TSMC develops, manufactures, imports, and sells for importation into the U.S. semiconductor devices, including to the Defendant. But TSMC does these things on the back of Globalfoundries, using Globalfoundries' patented technologies to make its products. Indeed, although its infringing chips have flooded the U.S. market, it appears that TSMC has attempted to avoid being subject to patent infringement allegations in the U.S. through creative legal and tax structuring. As set forth below, the Accused Products incorporate, without any license from Globalfoundries, many technologies developed by Globalfoundries and protected by patents owned by Globalfoundries. TSMC's, and/or its customers', importation of infringing articles into the U.S. from Greater China and elsewhere abroad directly harms Globalfoundries and its billions in U.S. investments in manufacturing. Globalfoundries respectfully seeks relief from this Court for Defendant's infringement.

### **THE ASSERTED PATENTS**

12. The '348 patent is entitled "Semiconductor device with transistor local interconnects," and issued on November 12, 2013, to inventors Mahbub Rashed, Steven Soss, Jongwook Kye, Irene Y. Lin, James Benjamin Gullette, Chinh Nguyen, Jeff Kim, Marc Tarabbia, Yuansheng Ma, Yunfei Deng, Rod Augur, Seung-Hyun Rhee, Scott Johnson, Subramani Kengeri, and Suresh Venkatesan. Globalfoundries owns the entire right, title, and interest in and to the '348 patent. A copy of the '348 patent is attached to this Complaint as Exhibit A.

13. The '910 patent is entitled "Semiconductor device with transistor local interconnects," and issued on May 31, 2016 to inventors Mahbub Rashed, Irene Y. Lin, Steven Soss, Jeff Kim, Chinh Nguyen, Marc Tarabbia, Scott Johnson, Subramani Kengeri, and Suresh Venkatesan. Globalfoundries owns the entire right, title, and interest in and to the '910 patent. A copy of the '910 patent is attached to this Complaint as Exhibit B.

14. The '497 patent is entitled "Introduction of metal impurity to change workfunction of conductive electrodes," and issued on September 16, 2008 to inventors Michael P. Chudzik, Bruce B. Doris, Supratik Guha, Rajarao Jammy, Vijay Narayanan, Vamsi K. Paruchuri, Yun Y. Wang, and Keith Kwong Hon Wong. Globalfoundries owns the entire right, title, and interest in and to the '497 patent. A copy of the '497 patent is attached to this Complaint as Exhibit C.

15. The '633 patent is entitled "Semiconductor device having contact layer providing electrical connections," and issued on December 3, 2013 to inventors Marc Tarabbia, James B. Gullette, Mahbub Rashed, David S. Doman, Irene Y. Lin, Ingolf Lorenz, Larry Ho, Chinh Nguyen, Jeff Kim, Jongwook Kye, Yuansheng Ma, Yunfel Deng, Rod Augur, Seung-Hyun Rhee, Jason E. Stephens, Scott Johnson, Subramani Kengeri, and Suresh Venkatesan. Globalfoundries owns the entire right, title, and interest in and to the '633 patent. A copy of the '633 patent is attached to this Complaint as Exhibit D.

16. The '167 patent is entitled "Method of forming a metal or metal nitride interface layer between silicon nitride and copper," and issued on February 11, 2003 to inventors Lu You, Matthew S. Buynoski, Paul R. Besser, Jeremias D. Romero, Pin-Chin Connie Wang, and Minh Q. Tran. Globalfoundries owns the entire right, title, and interest in and to the '167 patent. A copy of the '167 patent is attached to this Complaint as Exhibit E.

17. The '966 patent is entitled "Structures of and methods and tools for forming in-situ metallic/dielectric caps for interconnects," and issued on October 18, 2011 to inventors Chih-Chao Yang and Chao-Kun Hu. Globalfoundries owns the entire right, title, and interest in and to the '966 patent. A copy of the '966 patent is attached to this Complaint as Exhibit F.

#### **CLAIMS FOR PATENT INFRINGEMENT**

18. The allegations provided below are exemplary and without prejudice to Globalfoundries' infringement contentions. In providing these allegations, Globalfoundries does not convey or imply any particular claim constructions or the precise scope of the claims. Globalfoundries' claim construction contentions regarding the meaning and scope of the claim terms will be provided under the Court's scheduling order.

19. As detailed below, each element of at least one claim of each of the Asserted Patents is literally present in the Accused Products, or is literally practiced by the process through which each of the Accused Products is made. To the extent that any element is not literally present or practiced, each such element is present or practiced under the doctrine of equivalents.

### **COUNT I INFRINGEMENT OF THE '348 PATENT**

20. Globalfoundries incorporates by reference the allegations set forth in paragraphs 1 through 19 as though fully set forth herein.

21. On information and belief, Avnet has infringed and continues to infringe one or more claims of the '348 patent, including at least claim 1, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering for sale in the United States, without authority or license, integrated circuits manufactured by TSMC using, for example, TSMC's 16 Nanometer technology and products containing these integrated circuits (collectively, the "'348 Accused Products"), in violation of 35 U.S.C. § 271. The '348 Accused Products include at least field programmable gate arrays, including 3D ICs ("FPGAs"), adaptive compute acceleration platforms ("ACAPs"), and systems on a chip, including MPSoCs and RFSocS ("SoCs"), such as the Xilinx XCKU3P and XCKU15P families of FPGAs, and other Kintex UltraScale+ FPGAs, fabricated using, for example, TSMC's 16 Nanometer process.



22. On information and belief, Avnet has directly infringed and continues to infringe one or more claims of the '348 patent, including at least claim 1, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering to sell in the United States, without authority or license, '348 Accused Products, in violation of 35 U.S.C. § 271(a). On information and belief, Avnet imports '348 Accused Products into the United States for sales and distribution to customers located in the United States. On information and belief, Avnet uses the '348 Accused Products through at least testing, evaluations, and demonstrations. For example, on information and belief, as part of its sales and customer-service activities Avnet performs infringing demonstrations, evaluations, and testing of the Accused Products in the United States, including training courses. On information and belief, Avnet imports the '348 Accused Products for the aforementioned uses. On information and belief, Avnet sells '348 Accused Products in the United States. For example, Avnet hires permanent sales personnel located throughout the United States. In particular, Avnet has at least thirty-seven offices throughout the United States. On information and belief, many of these offices engage in sales activities. On information and belief, these sales activities include direct sales by Avnet to customers. On information and belief, Avnet offers the '348 Accused Products for sale in the United States. For example, Avnet engages in sales, marketing, and consulting activity in the United States and/or with United States offices of its customers. Avnet also sells and offers to sell the '348 Accused Products on its website [www.avnet.com](http://www.avnet.com). Avnet also widely publicizes its distributor relationship with Xilinx, including announcing partnerships with Xilinx through press releases and advertising itself as an authorized dealer of Xilinx products, including in the United States.

23. The '348 Accused Products meet all the limitations of at least claim 1 of the '348 patent. Specifically, claim 1 of the '348 patent claims a semiconductor device comprising: a semiconductor substrate; a first transistor and a second transistor formed on said semiconductor substrate; each of said transistors comprising a source, a drain, and a gate; a CA layer electrically connected to at least one of said source or said drain of said first transistor; and a CB layer electrically connected to both of said gates of said transistors and said CA layer.

24. The '348 Accused Products are semiconductor devices. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process.

25. The '348 Accused Products have a semiconductor substrate. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that the circuit's structures are fabricated on top of a semiconductor substrate.

26. The '348 Accused Products have a first transistor and a second transistor formed on said semiconductor substrate. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that at least two transistors are formed on the semiconductor substrate.

27. In the '348 Accused Products, each of the said transistors comprise a source, a drain, and a gate. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that at least two transistors are formed on the semiconductor substrate, where each transistor has a source, a drain, and a gate.

28. The '348 Accused Products have a CA layer electrically connected to at least one of said source or said drain of said first transistor. Each includes, for example, SRAM cells made up of multiple transistors. The SRAM cells are fabricated with a local interconnect layer that electrically connects to either the source or drain of a first transistor.

29. The '348 Accused Products have a CB layer electrically connected to both of said gates of said transistors and said CA layer. Each includes, for example, SRAM cells made up of multiple transistors. The SRAM cells are fabricated with a local interconnect layer that electrically connects the gate of the first transistor, the gate of the second transistor, and another local interconnect layer.

30. Globalfoundries has suffered and continues to suffer damages as a result of Defendant's infringement of the '348 patent.

31. Defendant's continuing acts of infringement are a basis of consumer demand for the '348 Accused Products. Defendant's continuing acts of infringement are therefore irreparably harming and causing damage to Globalfoundries, for which Globalfoundries has no adequate remedy at law, and will continue to suffer such irreparable injury unless Defendant's continuing acts of infringement are enjoined by the Court. The hardships that an injunction would impose are less than those faced by Globalfoundries should an injunction not issue. The public interest would be served by issuance of an injunction.

## **COUNT II INFRINGEMENT OF THE '910 PATENT**

32. Globalfoundries incorporates by reference the allegations set forth in paragraphs 1 through 31 as though fully set forth herein.

33. On information and belief, Avnet has infringed and continues to infringe one or more claims of the '910 patent, including at least claim 1, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering for sale in the United States, without authority or license, integrated circuits manufactured by TSMC using, for example, TSMC's 16 Nanometer technology and products containing these integrated circuits (collectively, the "'910 Accused Products"), in violation of 35 U.S.C. § 271. The '910

Accused Products include at least field programmable gate arrays, including 3D ICs (“FPGAs”), adaptive compute acceleration platforms (“ACAPs”), and systems on a chip, including MPSoCs and RFSocS (“SoCs”), such as the Xilinx XCKU3P and XCKU15P families of FPGAs, and other Kintex UltraScale+ FPGAs, fabricated using, for example, TSMC’s 16 Nanometer process.

34. On information and belief, Avnet has directly infringed and continues to infringe one or more claims of the ’910 patent, including at least claim 1, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering to sell in the United States, without authority or license, ’910 Accused Products, in violation of 35 U.S.C. § 271(a). On information and belief, Avnet imports ’910 Accused Products into the United States for sales and distribution to customers located in the United States. On information and belief, Avnet uses the ’910 Accused Products through at least testing, evaluations, and demonstrations. For example, on information and belief, as part of its sales and customer-service activities Avnet performs infringing demonstrations, evaluations, and testing of the Accused Products in the United States, including training courses. On information and belief, Avnet imports the ’910 Accused Products for the aforementioned uses. On information and belief, Avnet sells ’910 Accused Products in the United States. For example, Avnet hires permanent sales personnel located throughout the United States. In particular, Avnet has at least thirty-seven offices throughout the United States. On information and belief, many of these offices engage in sales activities. On information and belief, these sales activities include direct sales by Avnet to customers. On information and belief, Avnet offers the ’910 Accused Products for sale in the United States. For example, Avnet engages in sales, marketing, and consulting activity in the United States and/or with United States offices of its customers. Avnet also sells and offers to sell the ’910 Accused Products on its website [www.avnet.com](http://www.avnet.com). Avnet also widely publicizes its

distributor relationship with Xilinx, including announcing partnerships with Xilinx through press releases and advertising itself as an authorized dealer of Xilinx products, including in the United States.

35. The '910 Accused Products meet all the limitations of at least claim 1 of the '910 patent. Specifically, claim 1 of the '910 patent claims a semiconductor device comprising: a semiconductor substrate; a first transistor and a second transistor disposed on said substrate; each of said transistors comprising a source, a drain, and a gate; a first CB layer electrically connected to said gate of said first transistor; a second CB layer electrically connected to said gate of said second transistor; and a CA layer extending longitudinally between a first end and a second end; wherein said first CB layer is electrically connected to said first end of said CA layer; said second CB layer is electrically connected to said second end of said CA layer; said gate of said first transistor extends longitudinally along a first line and said gate of said second transistor extends longitudinally along a second line, wherein said first and second lines are generally parallel to one another and spaced apart from one another; and said CA layer extends generally parallel to said lines and generally perpendicular to said first CB layer and said second CB layer; and wherein said first CB layer extends longitudinally beyond said gate of said first transistor and/or said second CB layer extends longitudinally beyond said gate of said second transistor.

36. The '910 Accused Products are semiconductor devices. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process.

37. The '910 Accused Products have a semiconductor substrate. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that the circuit's structures are fabricated on top of a semiconductor substrate.

38. The '910 Accused Products have a first transistor and a second transistor disposed on said substrate. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that at least two transistors are formed on the semiconductor substrate.

39. In the '910 Accused Products, each of the said transistors comprise a source, a drain, and a gate. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that at least two transistors are formed on the substrate, where each transistor has a source, a drain, and a gate.

40. The '910 Accused Products have a first CB layer electrically connected to said gate of said first transistor. Each includes, for example, SRAM cells made up of multiple transistors. The SRAM cells are fabricated with a local interconnect layer that electrically connects to the gate of a first transistor.

41. The '910 Accused Products have a second CB layer electrically connected to said gate of said second transistor. Each includes, for example, SRAM cells made up of multiple transistors. The SRAM cells are fabricated with another local interconnect layer that electrically connects to the gate of a second transistor.

42. The '910 Accused Products have a CA layer extending longitudinally between a first end and a second end; wherein said first CB layer is electrically connected to said first end of said CA layer; said second CB layer is electrically connected to said second end of said CA layer. Each includes, for example, SRAM cells made up of multiple transistors. The SRAM cells are fabricated with a layer having a first end and a second end that extends longitudinally such that its ends electrically connect the first and second local interconnect layers.

43. In the '910 Accused Products, the gate of said first transistor extends longitudinally along a first line and said gate of said second transistor extends longitudinally along a second line, wherein said first and second lines are generally parallel to one another and spaced apart from one another. Each includes, for example, SRAM cells made up of multiple transistors. The SRAM cells are fabricated such that the first and second transistors include gates that extend longitudinally along lines that are generally parallel to one another and spaced apart.

44. In the '910 Accused Products, the CA layer extends generally parallel to said lines and generally perpendicular to said first CB layer and said second CB layer. Each includes, for example, SRAM cells made up of multiple transistors. The SRAM cells are fabricated such that a local interconnect layer is parallel to the lines on which the gates of the first and second transistors lie, and the local interconnect layer is perpendicular to the first and second local interconnect layers described in ¶¶ 40 and 41.

45. In the '910 Accused Products, one or both of the CB layers extends longitudinally beyond the respective gates of the first and second transistors. Each includes, for example, SRAM cells made up of multiple transistors. The SRAM cells are fabricated such that the local interconnect layers described in ¶¶ 40 and 41 extend longitudinally beyond the gates of a first and/or second transistor.

46. Globalfoundries has suffered and continues to suffer damages as a result of Defendant's infringement of the '910 patent.

47. Defendant's continuing acts of infringement are a basis of consumer demand for the '910 Accused Products. Defendant's continuing acts of infringement are therefore irreparably harming and causing damage to Globalfoundries, for which Globalfoundries has no adequate remedy at law, and will continue to suffer such irreparable injury unless Defendant's continuing

acts of infringement are enjoined by the Court. The hardships that an injunction would impose are less than those faced by Globalfoundries should an injunction not issue. The public interest would be served by issuance of an injunction.

**COUNT III  
INFRINGEMENT OF THE '497 PATENT**

48. Globalfoundries incorporates by reference the allegations set forth in paragraphs 1 through 47 as though fully set forth herein.

49. On information and belief, Avnet has directly infringed and continues to infringe claim 1 of the '497 patent literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering for sale in the United States, without authority or license, integrated circuits manufactured by TSMC using, for example, TSMC's 28 Nanometer or 16 Nanometer technology and products containing these integrated circuits (collectively, the "'497 Accused Products"), in violation of 35 U.S.C. § 271. The '497 Accused Products include at least field programmable gate arrays, including 3D ICs ("FPGAs"), adaptive compute acceleration platforms ("ACAPs"), and systems on a chip, including MPSoCs and RFSocCs ("SoCs"), such as the Xilinx XCKU3P and XCKU15P families of FPGAs, and other Kintex UltraScale+ FPGAs, fabricated using, for example, TSMC's 28 Nanometer or 16 Nanometer process.

50. On information and belief, Avnet has directly infringed and continues to infringe claim 1 of the '497 patent literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering to sell in the United States, without authority or license, '497 Accused Products, in violation of 35 U.S.C. § 271(g). On information and belief, Avnet imports '497 Accused Products into the United States for sales and distribution to customers located in the United States. On information and belief, Avnet uses the '497 Accused



Products through at least testing, evaluations, and demonstrations. For example, on information and belief, as part of its sales and customer-service activities Avnet performs infringing demonstrations, evaluations, and testing of the Accused Products in the United States, including training courses. On information and belief, Avnet imports the '497 Accused Products for the aforementioned uses. On information and belief, Avnet sells '497 Accused Products in the United States. For example, Avnet hires permanent sales personnel located throughout the United States. In particular, Avnet has at least thirty-seven offices throughout the United States. On information and belief, many of these offices engage in sales activities. On information and belief, these sales activities include direct sales by Avnet to customers. On information and belief, Avnet offers the '497 Accused Products for sale in the United States. For example, Avnet engages in sales, marketing, and consulting activity in the United States and/or with United States offices of its customers. Avnet also sells and offers to sell the '497 Accused Products on its website [www.avnet.com](http://www.avnet.com). Avnet also widely publicizes its distributor relationship with Xilinx, including announcing partnerships with Xilinx through press releases and advertising itself as an authorized dealer of Xilinx products, including in the United States.

51. The '497 Accused Products are manufactured by a process including all of the limitations of claim 1 of the '497 patent. Specifically, claim 1 of the '497 patent claims a method of changing workfunction of a conductive stack comprising: providing a material stack that comprises a Hf-based dielectric having a dielectric constant of greater than silicon dioxide, a metal-containing material including at least one metal selected from Ti, Zr, Hf, V, Nb and Ta located above said Hf-based dielectric, and a conductive electrode located above said metal-containing material; and introducing at least one workfunction altering metal impurity into said metal-containing material, wherein said at least one workfunction altering metal impurity is introduced

during forming of a metal impurity containing layer or after formation of a layer containing said metal-containing material, and said introducing is selected from (i) codepositing the at least one workfunction altering metal impurity and the metal-containing material, (ii) forming a first layer of the metal-containing material, forming a layer containing the metal impurities on said first layer, and forming a second layer of the metal-containing material, and (iii) forming a material layer containing the metal impurities below and/or above the metal-containing material, and subjecting the material stack to a thermal process, and with the proviso that when an n-type workfunction is required, the at least one workfunction altering metal impurity comprises at least one element from Groups IIIB, IVB, or VB of the Periodic Table of Elements, and when a p-type workfunction is required the at least one workfunction altering metal impurity comprises at least one element from VIB, VIIB or VIII of the Periodic Table of Elements.

52. The '497 Accused Products are made by a method of changing workfunction of a conductive stack. TSMC's manufacture of each of the '497 Accused Products involves changing workfunction for at least some conductive stacks in the product.

53. During the manufacture of the '497 Accused Products, a material stack is provided that comprises a Hf-based dielectric having a dielectric constant of greater than silicon dioxide, a metal-containing material including at least one metal selected from Ti, Zr, Hf, V, Nb and Ta located above said Hf-based dielectric, and a conductive electrode located above said metal-containing material. TSMC's manufacture of at least one n-type FET in each of the '497 Accused Products includes creating a material stack with an Hf-based dielectric on top of a substrate. Hf-based dielectrics are known in the art to have a dielectric constant greater than silicon dioxide. TSMC's manufacture of at least one n-type FET in each of the '497 Accused Products includes a metal-containing material that includes titanium metal above the Hf-based dielectric. TSMC's

manufacture of at least one n-type FET in each of the '497 Products includes a conductive electrode located above the metal-containing material to form the gate of at least one n-type FET.

54. During the manufacture of the '497 Accused Products, at least one workfunction altering metal impurity is introduced into said metal-containing material, wherein said at least one workfunction altering metal impurity is introduced during forming of a metal impurity containing layer or after formation of a layer containing said metal-containing material, and said introducing is selected from (i) codepositing the at least one workfunction altering metal impurity and the metal-containing material, (ii) forming a first layer of the metal-containing material, forming a layer containing the metal impurities on said first layer, and forming a second layer of the metal-containing material, and (iii) forming a material layer containing the metal impurities below and/or above the metal-containing material, and subjecting the material stack to a thermal process, and with the proviso that when an n-type workfunction is required, the at least one workfunction altering metal impurity comprises at least one element from Groups IIIB, IVB, or VB of the Periodic Table of Elements, and when a p-type workfunction is required the at least one workfunction altering metal impurity comprises at least one element from VIB, VIIB or VIII of the Periodic Table of Elements. TSMC's manufacture of at least one n-type FET in each of the '497 Accused Products includes introducing tantalum into the metal-containing material. The tantalum is introduced into the metal impurity containing layer by forming a first layer of the metal-containing material (titanium), forming a layer containing the tantalum metal impurities on the first layer, and forming a second layer of the metal-containing material (titanium). Tantalum is a Group VB metal. By this process, the workfunction of the material stack is altered.

55. On information and belief, the '497 Accused Products are neither materially changed by subsequent processes nor become trivial and nonessential components of another product.

56. Globalfoundries has suffered and continues to suffer damages as a result of Defendant's infringement of the '497 patent.

57. Defendant's continuing acts of infringement are a basis of consumer demand for the '497 Accused Products. Defendant's continuing acts of infringement are therefore irreparably harming and causing damage to Globalfoundries, for which Globalfoundries has no adequate remedy at law, and will continue to suffer such irreparable injury unless Defendant's continuing acts of infringement are enjoined by the Court. The hardships that an injunction would impose are less than those faced by Globalfoundries should an injunction not issue. The public interest would be served by issuance of an injunction.

#### **COUNT IV INFRINGEMENT OF THE '633 PATENT**

58. Globalfoundries incorporates by reference the allegations set forth in paragraphs 1 through 57 as though fully set forth herein.

59. On information and belief, Avnet has infringed and continues to infringe one or more claims of the '633 patent, including at least claim 1, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering for sale in the United States, without authority or license, integrated circuits manufactured by TSMC using, for example, TSMC's 16 Nanometer technology and products containing these integrated circuits (collectively, the "'633 Accused Products"), in violation of 35 U.S.C. § 271. The '633 Accused Products include at least field programmable gate arrays, including 3D ICs ("FPGAs"), adaptive compute acceleration platforms ("ACAPs"), and systems on a chip, including MPSoCs

and RFSocS (“SoCs”), such as the Xilinx XCKU3P and XCKU15P families of FPGAs, and other Kintex UltraScale+ FPGAs, fabricated using, for example, TSMC’s 16 Nanometer process.

60. On information and belief, Avnet has directly infringed and continues to infringe one or more claims of the ’633 patent, including at least claim 1, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering to sell in the United States, without authority or license, ’633 Accused Products, in violation of 35 U.S.C. § 271(a). On information and belief, Avnet imports ’633 Accused Products into the United States for sales and distribution to customers located in the United States. On information and belief, Avnet uses the ’633 Accused Products through at least testing, evaluations, and demonstrations. For example, on information and belief, as part of its sales and customer-service activities Avnet performs infringing demonstrations, evaluations, and testing of the Accused Products in the United States, including training courses. On information and belief, Avnet imports the ’633 Accused Products for the aforementioned uses. On information and belief, Avnet sells ’633 Accused Products in the United States. For example, Avnet hires permanent sales personnel located throughout the United States. In particular, Avnet has at least thirty-seven offices throughout the United States. On information and belief, many of these offices engage in sales activities. On information and belief, these sales activities include direct sales by Avnet to customers. On information and belief, Avnet offers the ’633 Accused Products for sale in the United States. For example, Avnet engages in sales, marketing, and consulting activity in the United States and/or with United States offices of its customers. Avnet also sells and offers to sell the ’633 Accused Products on its website [www.avnet.com](http://www.avnet.com). Avnet also widely publicizes its distributor relationship with Xilinx, including announcing partnerships with Xilinx through press

releases and advertising itself as an authorized dealer of Xilinx products, including in the United States.

61. The '633 Accused Products meet all the limitations of at least claim 1 of the '633 patent. Specifically, claim 1 of the '633 patent claims a semiconductor device comprising: a semiconductor substrate having a diffusion region; a transistor formed within said diffusion region and comprising a source, a drain, and a gate; a metal layer including a power rail disposed outside said diffusion region and a pin layer extending from said diffusion region to outside said diffusion region; a contact layer disposed above said substrate and below said metal layer; and a via disposed between said contact layer and said power rail to electrically connect said contact layer to said power rail; and wherein said contact layer includes a first length disposed outside said diffusion region and a second length extending from said first length into said diffusion region and electrically connected to said transistor.

62. The '633 Accused Products are semiconductor devices. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process.

63. The '633 Accused Products have a semiconductor substrate having a diffusion region. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that the circuit's structures are fabricated on top of a semiconductor substrate. The substrate of each has a diffusion region.

64. The '633 Accused Products have a transistor formed within the diffusion region and comprising a source, a drain, and a gate. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that each has a transistor formed within the diffusion region of the substrate, where each transistor has a source, a drain, and a gate.

65. The '633 Accused Products have a metal layer including a power rail disposed outside said diffusion region and a pin layer extending from said diffusion region to outside said diffusion region. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that each has a metal layer including a power rail, where the power rail is disposed outside the diffusion region. Each has a pin layer extending from the diffusion region to outside the diffusion region. For example, in integrated circuits including a GPU, a power rail is formed outside the diffusion region at the M1 level, and a pin layer is formed extending both inside and outside the diffusion region.

66. The '633 Accused Products have a contact layer disposed above said substrate and below said metal layer; and a via disposed between said contact layer and said power rail to electrically connect said contact layer to said power rail. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process such that each has a contact layer disposed above the substrate and below the metal layer. Each has a via between the contact layer and the power rail. The via connects the contact layer to the power rail. For example, in integrated circuits including a GPU, a contact layer is formed below the M1 level, and at least one via is disposed between the contact layer and the power rail such that the two are electrically connected.

67. In the '633 Accused Products said contact layer includes a first length disposed outside said diffusion region and a second length extending from said first length into said diffusion region and electrically connected to said transistor. The contact layer has a first length disposed outside the diffusion region. The contact layer includes a second length extending from the first length into the diffusion region. At least some of the second lengths are electrically connected to at least some of the transistors. For example, in integrated circuits including a GPU,

the contact layer is formed such that it extends from outside the diffusion region to inside the diffusion region and electrically connects to at least some transistors.

68. Globalfoundries has suffered and continues to suffer damages as a result of Defendant's infringement of the '633 patent.

69. Defendant's continuing acts of infringement are a basis of consumer demand for the '633 Accused Products. Defendant's continuing acts of infringement are therefore irreparably harming and causing damage to Globalfoundries, for which Globalfoundries has no adequate remedy at law, and will continue to suffer such irreparable injury unless Defendant's continuing acts of infringement are enjoined by the Court. The hardships that an injunction would impose are less than those faced by Globalfoundries should an injunction not issue. The public interest would be served by issuance of an injunction.

**COUNT V  
INFRINGEMENT OF THE '167 PATENT**

70. Globalfoundries incorporates by reference the allegations set forth in paragraphs 1 through 69 as though fully set forth herein.

71. On information and belief, Avnet has infringed and continues to infringe one or more claims of the '167 patent, including at least claim 1, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering for sale in the United States, without authority or license, integrated circuits manufactured by TSMC using, for example, TSMC's 16 Nanometer technology and products containing these integrated circuits (collectively, the "'167 Accused Products"), in violation of 35 U.S.C. § 271. The '167 Accused Products include at least field programmable gate arrays, including 3D ICs ("FPGAs"), adaptive compute acceleration platforms ("ACAPs"), and systems on a chip, including MPSoCs



and RFSocS (“SoCs”), such as the Xilinx XCKU3P and XCKU15P families of FPGAs, and other Kintex UltraScale+ FPGAs, fabricated using, for example, TSMC’s 16 Nanometer process.

72. On information and belief, Avnet has directly infringed and continues to infringe one or more claims of the ’167 patent, including at least claim 1, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering to sell in the United States, without authority or license, ’167 Accused Products, in violation of 35 U.S.C. § 271(g). On information and belief, Avnet imports ’167 Accused Products into the United States for sales and distribution to customers located in the United States. On information and belief, Avnet uses the ’167 Accused Products through at least testing, evaluations, and demonstrations. For example, on information and belief, as part of its sales and customer-service activities Avnet performs infringing demonstrations, evaluations, and testing of the Accused Products in the United States, including training courses. On information and belief, Avnet imports the ’167 Accused Products for the aforementioned uses. On information and belief, Avnet sells ’167 Accused Products in the United States. For example, Avnet hires permanent sales personnel located throughout the United States. In particular, Avnet has at least thirty-seven offices throughout the United States. On information and belief, many of these offices engage in sales activities. On information and belief, these sales activities include direct sales by Avnet to customers. On information and belief, Avnet offers the ’167 Accused Products for sale in the United States. For example, Avnet engages in sales, marketing, and consulting activity in the United States and/or with United States offices of its customers. Avnet also sells and offers to sell the ’167 Accused Products on its website [www.avnet.com](http://www.avnet.com). Avnet also widely publicizes its distributor relationship with Xilinx, including announcing partnerships with Xilinx through press

releases and advertising itself as an authorized dealer of Xilinx products, including in the United States.

73. The '167 Accused Products are manufactured by a process including all of the limitations of at least claim 1 of the '167 patent. Specifically, claim 1 of the '167 patent claims a method of forming a metal layer interface between a copper layer and a silicon nitride layer, the method comprising: providing a metal organic gas over a copper layer; forming a metal layer from reactions between the metal organic gas and the copper layer; and depositing a silicon nitride layer over the metal layer and copper layer, the metal layer providing an interface adhesion between the silicon nitride layer and the copper layer.

74. The '167 Accused Products are made by a method of forming a metal layer interface between a copper layer and a silicon nitride layer. TSMC's manufacture of the '167 Accused Products results in a metal layer interface. The metal layer interface is between a copper layer and a silicon nitride layer. On information and belief, TSMC uses a selective CVD cobalt process to perform this method.

75. During the manufacture of the '167 Accused Products a metal organic gas is provided over a copper layer. TSMC's manufacture of the '167 Accused Products provides a metal organic gas over a copper layer. On information and belief, TSMC uses a selective CVD cobalt process to perform this method.

76. During the manufacture of the '167 Accused Products, a metal layer is formed from reactions between the metal organic gas and the copper layer. TSMC's manufacture of the '167 Accused Products forms a cobalt metal layer from reactions between the metal organic gas and the copper layer. On information and belief, TSMC uses a selective CVD cobalt process to perform this method.

77. During the manufacture of the '167 Accused Products, a silicon nitride layer is deposited over the metal layer and the copper layer. On information and belief, TSMC's manufacture of the '167 Accused Products deposits a silicon nitride layer over the metal layer and the copper layer. On information and belief, TSMC uses a selective CVD cobalt process to perform this method.

78. During the manufacture of the '167 Accused Products, the metal layer provides an interface adhesion between the silicon nitride layer and the copper layer. TSMC's manufacture of the '167 Accused Products provides an interface adhesion between the silicon nitride layer and the copper layer. On information and belief, TSMC uses a selective CVD cobalt process to perform this method.

79. On information and belief, the '167 Accused Products are neither materially changed by subsequent processes nor become trivial and nonessential components of another product.

80. Globalfoundries has suffered and continues to suffer damages as a result of Defendant's infringement of the '167 patent.

81. Defendant's continuing acts of infringement are a basis of consumer demand for the '167 Accused Products. Defendant's continuing acts of infringement are therefore irreparably harming and causing damage to Globalfoundries, for which Globalfoundries has no adequate remedy at law, and will continue to suffer such irreparable injury unless Defendant's continuing acts of infringement are enjoined by the Court. The hardships that an injunction would impose are less than those faced by Globalfoundries should an injunction not issue. The public interest would be served by issuance of an injunction.

**COUNT VI  
INFRINGEMENT OF THE '966 PATENT**

82. Globalfoundries incorporates by reference the allegations set forth in paragraphs 1 through 81 as though fully set forth herein.

83. On information and belief, Avnet has infringed and continues to infringe one or more claims of the '966 patent, including at least claim 12, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering for sale in the United States, without authority or license, integrated circuits manufactured by TSMC using, for example, TSMC's 16 Nanometer technology and products containing these integrated circuits (collectively, the "'966 Accused Products"), in violation of 35 U.S.C. § 271. The '966 Accused Products include at least field programmable gate arrays, including 3D ICs ("FPGAs"), adaptive compute acceleration platforms ("ACAPs"), and systems on a chip, including MPSoCs and RFSOCs ("SoCs"), such as the Xilinx XCKU3P and XCKU15P families of FPGAs, and other Kintex UltraScale+ FPGAs, fabricated using, for example, TSMC's 16 Nanometer process.

84. On information and belief, Avnet has directly infringed and continues to infringe one or more claims of the '966 patent, including at least claim 12, literally or under the doctrine of equivalents, by importing into the United States, and/or using, and/or selling, and/or offering to sell in the United States, without authority or license, '966 Accused Products, in violation of 35 U.S.C. § 271(a) and (g). On information and belief, Avnet imports '966 Accused Products into the United States for sales and distribution to customers located in the United States. On information and belief, Avnet uses the '966 Accused Products through at least testing, evaluations, and demonstrations. For example, on information and belief, as part of its sales and customer-service activities Avnet performs infringing demonstrations, evaluations, and testing of the Accused Products in the United States, including training courses. On information and belief, Avnet imports the '966 Accused Products for the aforementioned uses. On information and belief,

Avnet sells '966 Accused Products in the United States. For example, Avnet hires permanent sales personnel located throughout the United States. In particular, Avnet has at least thirty-seven offices throughout the United States. On information and belief, many of these offices engage in sales activities. On information and belief, these sales activities include direct sales by Avnet to customers. On information and belief, Avnet offers the '966 Accused Products for sale in the United States. For example, Avnet engages in sales, marketing, and consulting activity in the United States and/or with United States offices of its customers. Avnet also sells and offers to sell the '966 Accused Products on its website [www.avnet.com](http://www.avnet.com). Avnet also widely publicizes its distributor relationship with Xilinx, including announcing partnerships with Xilinx through press releases and advertising itself as an authorized dealer of Xilinx products, including in the United States.

85. The '966 Accused Products meet all the limitations of at least claim 12 of the '966 patent. Specifically, claim 12 of the '966 patent claims a structure, comprising: a wire embedded in a dielectric layer on a semiconductor substrate, said wire comprising a copper core and an electrically conductive liner on sidewalls and a bottom of said copper core, said copper core and said electrically conductive liner exposed at a top surface of said dielectric layer; a metal cap on an entire top surface of said copper core; a dielectric cap only over (i) said metal cap, (ii) any exposed portions of said liner, and (iii) on said top surface of said dielectric layer; and wherein an interface between said copper core and said metal layer does not contain oxygen.

86. The '966 Accused Products are structures. Each is an integrated circuit fabricated using, for example, TSMC's 16 Nanometer semiconductor process.

87. The '966 Accused Products have a wire embedded on a dielectric layer on a semiconductor substrate. Each is an integrated circuit fabricated using, for example, TSMC's 16

Nanometer semiconductor process such that there is a dielectric layer on a semiconductor substrate. For example, at least some of the '966 Accused Products have a SiOC dielectric layer on a semiconductor substrate. The '966 Accused Products have a wire embedded in the dielectric layer as part of, for example, the M1-M3 interconnects.

88. The '966 Accused Products have a wire that has a copper core and an electrically conductive liner on sidewalls and a bottom of said copper core. Each contains wires with copper cores, for example as part of the M1-M3 interconnects. At least some of those wires have an electrically conductive liner including, for example, tantalum and cobalt, on the sidewalls and bottom of the copper core. Tantalum and cobalt are electrically conductive.

89. The '966 Accused Products have a wire that has a copper core and an electrically conductive liner exposed at the top surface of said dielectric layer. In the '966 Accused Products, in at least some instances, the copper core, electrically conductive liner including cobalt and tantalum are exposed at the top surface of the dielectric layer of, for example, at least one of the M1-M3 interconnect layers.

90. The '966 Accused Products have a metal cap on an entire top surface of said copper core. In the '966 Accused Products, at least some the wires have a cobalt cap on the entire top surface of the copper core. Cobalt is a metal.

91. The '966 Accused Products have a dielectric cap only over said metal cap, any exposed portions of said liner, and on said top surface of said dielectric layer. In the '966 Accused Products at least some of the wires have, for example, a SiNC dielectric cap that covers only the cobalt metal cap, any exposed portions of the conductive liner, and the top surface of the SiOC dielectric layer.

92. The '966 Accused Products have a structure wherein an interface between said copper core and said metal layer does not contain oxygen. In the '966 Accused Products, the interface between the copper core and the cobalt cap of at least some of the wires contains no oxygen.

93. On information and belief, the '966 Accused Products are neither materially changed by subsequent processes nor become trivial and nonessential components of another product.

94. Globalfoundries has suffered and continues to suffer damages as a result of Defendant's infringement of the '966 patent.

95. Defendant's continuing acts of infringement are a basis of consumer demand for the '966 Accused Products. Defendant's continuing acts of infringement are therefore irreparably harming and causing damage to Globalfoundries, for which Globalfoundries has no adequate remedy at law, and will continue to suffer such irreparable injury unless Defendant's continuing acts of infringement are enjoined by the Court. The hardships that an injunction would impose are less than those faced by Globalfoundries should an injunction not issue. The public interest would be served by issuance of an injunction.

#### **JURY DEMAND**

96. Plaintiff demands a jury trial as to all issues that are triable by a jury in this action.

#### **PRAYER FOR RELIEF**

WHEREFORE, Plaintiff respectfully prays for relief as follows:

(a) Judgment that Defendant is liable for infringement of one or more claims of each of the Asserted Patents;

(b) An Order permanently enjoining Defendant and its respective officers, agents, employees, and those acting in privity or in active concert or participation with it, from further infringement of the Asserted Patents;

(c) Compensatory damages in an amount according to proof, including lost profits, and in any event no less than a reasonable royalty;

(d) Pre-judgment interest;

(e) Post-judgment interest;

(f) Attorneys' fees based on this being an exceptional case pursuant to 35 U.S.C. § 285, including pre-judgment interest on such fees;

(g) An accounting and/or supplemental damages for all damages occurring after any discovery cutoff and through final judgment;

(h) Costs and expenses in this action; and

(i) Any further relief that the Court deems just and proper.

Dated: August 26, 2019

Respectfully submitted,

/s/ Raymond W. Mort, III

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